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Impact of Covid-19 on Income Inequality; a Comparative Analysis for China and Italy

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ABSTRACT: This study examines the impact of covid 19 on income inequality and comparison between China and Italy. Trends in Gini coefficient showed differentiated results for two countries. In this comparison various indicators came to consideration that affected inequality. For empirical investigation from the past data collected from World Development Indicators and Generalized methods of moments (GMM) for panel data analysis. Results indicated that poverty and unemployment have significant positive impact on income inequality while rate of taxes shown negative and significant impact on income inequality. These results supported many other studies but the post covid trend in Gini coefficient shows contradictory results. Rising trend in income inequality in China and falling trend in Italy drives the attention in mitigation policies. China preferred to save its population from corona virus and implemented strict stay at home and isolation policy. In this regard inequality showed rising trend. Whereas Italian government along with isolation and stay at home policies financed poor much and paid less attention to rich. In this way the gap between rich and poor came down. This study pays attention to the country-based policies reflecting government preferences and initiatives taken for betterment.

KEYWORDS: Income Inequality, Covid-19, Gini coefficient, lorenz curve, Italy and China.

1. INTRODUCTION AND BACKGROUND

At present the COVID-19 pandemic is a real challenge for the globe. Since December 2019 to till now, pandemic has stricken the major economic and socioeconomic indicators. The pandemic has paved the barriers on the path of economic growth for developed as well as developing countries (Jorda 2020). In the mid 2020 number of corona virus reported cases were reached to 150,000,000 over the globe. It started from China and then severely attacked the Western European countries mainly Italy, France, Germany and Spain (Ferguson *et al.,* 2020). In the world many researchers paid attention and conducted empirical investigation of pandemic effects on financial indicators as Bakas and Triantafyllou (2020) computed the negative and significant effect of pandemic on commodity price unpredictability. In general, the overall economic activities and business cycle have faced downturns. In cross countries comparative analysis uncertainty due to pandemics has adversely affected the household's consumption level S. Wu (2020).

Income inequality is also considered as one of the main financial indicators that is significantly affected with pandemic Galletta and Giommoni (2020). To quantify the inequality there are various determinants including demographic, economic efficiency, access to resources, quality of institutions, labour market regulations, per head income etc. As for as European economies are concerned, European Union (EU) devastated a huge package of $ 1.8 trillion to make European countries resilient. Many European researchers carried out sample survey analysis to compute the diversified impacts of covid 19 (Layard *et al*., 2020, and Fang *et al*., 2020).

Many studies in this nexus for European countries identified a decline in income inequality from january 2020 to january 2021 (Brunori *et al.,* 2020 and Brewer and Tasseva 2021). The reason behind this negative relation is explained by these studies is that, as there existed differences in losses of the households but Italian government launched many schemes for compensation which targeted the poor not the rich people? In this way circulation of wealth increased from rich to poor and consequence the decrease in inequality. In such hardships and downturn in economic activities, due to huge unemployment and poverty raised in mental illness cases, increasing suicidal attempts and r social evils including theft and robbery (Knapp and Wong, 2020; Viinamaki *et al.,* 2000).

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In recent pandemic the household's income declined due to unemployment and hence there seems a rise in savings level for precautionary motives. According to the World Bank recent report the decline in household's income was due to maintenance of social distancing, isolation and fear of contagiousness. S.Wu (2020) also found the similar results that household's consumption was reduced for the sake of precautionary measures. The COVID-19 pandemic disrupted the global economic activities and resulted in huge unemployment and poverty (International Labour Organization, ILO 2020; International Monetary Fund, IMF 2020). This situation created bigger challenges for labour market regarding mobility, wage rate, efficiency and total factor productivity (Brenner and Bhugra, 2020; Crayne, 2020; and Ksinan Jiskrova et al., 2021).

Fiscal policy is considered as one of the major channels as During COVID 19 fiscal policies in many democratic countries played a vital role to introduce various packages to households in order to maintain isolation and social distancing. Other than this, to protect people from starvation government introduced the supply of necessities at home especially Chinese government (Gozgor 2021). On the other side these governments also implemented strict lockdown and social distancing policies that kept many workers at home and hence resulted in increased inequality.

During the uncertain economic shocks when government starts its packages to save people from starvation, there arise a new debate regarding their effects. As in the short run these stimulus packages seem positive effects but in the long run these packages may lead to higher tax burden on public in coming years. In various studies tax policies and rise in public debts have shown significantly negative effects on income inequality (Pikkety 2015, Milanovic 2016).

The selection of two countries is justifiable only because these are the two countries were highly vulnerable to Covid 19 regarding number of positive covid cases and number of deaths (Galleta *et al.,* 2020 and Furceri *et al.,* 2020). As literature indicated the differentiated results for both the countries. In case of Italy Covid 19 has reduced the inequality because government focused initiatives for poorer not for rich (Brewer and Tasseva 2021 and Giommoni 2020). In case of china even before this pandemic, there seemed rising trend in income inequality despite higher economic growth and developed agriculture, industry and services sector.

Existing studies for china indicated a significant increase in inequality with the passage of time but the results were differentiated at regional level. More developed region seems less inequality while less developed region indicated higher income inequality. Similarly rural and urban classification also rendered differentiated results (Xie and Zhou 2014). This research aims to analyze the inequality comparison between two countries in 2020, and empirical investigation for the major factors that resulted income inequality in the past and to suggest some implications based on findings.

2. LITERATURE REVIEW

As Corona virus was a tough challenge for the stakeholders to maintain economic stability. Many researchers conducted theoretical and empirical analysis in various dimensions of COVID effects. Sayed and Peng (2020) analyzed the impact of pandemics on inequality globally and mainly focused to France, Germany UK and US. They applied Fixed Effects and Augmented mean group estimators for empirical analysis. Results show a suppressing impact of uncertainty on income inequality.

For European economy Spanish flu[1] of 1918 was a serious challenge as a pandemic. At that time flu was contagious and fast spreading. That flu affected the income consumption, saving investment pattern and a huge unemployment in the region with higher income inequality. Again in 2020, European countries are victimized with COVID-19 that suppressed huge unemployment, poverty and trade. Galletta and Giommoni (2020) also found the significant negative effect of pandemic 2019 on income inequality. These findings also indicated that due to the lower income the share of poor people decline up to a greater extent.

Gini coefficient is a common measure for income inequality that shows the comparative share of cumulative population and its respective share in cumulative income. Furceri *et al.,* (2020) concluded that pandemics resulted in higher value of gini coefficient, but this research is based on the dummy variables shocks that indicate pandemics. Sharp decline in income found due to huge unemployment in developed and developing countries (Vos, Martin, and Laborde 2020; Mahler *et al.,* 2020; and McKibbin and Fernando 2020). Due to corona virus a sharp decline in income of 20 percent was found over the globe (Sumner *et al.,* 2020).

Poverty itself is also a greater reason for pandemic spread Ahmed *et al.,* (2020). This is because poor people are more vulnerable because they work and fulfill their daily basic needs. As even due to pandemic, even in lockdown situation they try to find the work for survival and resulted in pandemic spread rapidly. Same is the case was with Asian countries. Even due to strict lockdown by the governments, more people tried to find the job opportunities for survival that might be was a greater reason of quick pandemic spread.

[1] *Spanish flu started in US in 1918 named with "Great Influenza Epidemic". It attacked the US population with its four waves and gradually came to an end in 1921. This epidemic affected almost one third of the word's population and was considered as deadliest pandemics in the world.*

In China during mid-2020 all 31 provinces had initiated the policy of strict lockdown and emergency to maintain the social distance and stay at home to stop its more spread. Most of the labour force gets unemployed due to severe restrictions and hence income of people especially poorer declines more Fang *et al* (2020). Due to the designation of closed management policies, there were severe restrictions imposed on family outdoor work and activities in more than 250 cities other than Hubei province. (Qiu and Chen 2020).

Developed countries managed for online work from home to some extent during covid 19 but developing countries failed to manage that. Saltiel (2020) conducted survey analysis for the ten developing countries in order to analyze the management of work from home situation. He used survey data conducted by US namely Skills Toward Employment and Productivity (STEP)[2]. Results showed that only few jobs can be managed at home from 5 to 23 percent. These jobs have positive significant impact on GDP per capita but the online job management was not enough to secure the income of people victimized with corona virus.

Regional analysis in case of China also showed some interesting results as in more developed region there were a greater number of cases and deaths as well which caused longer social distancing policies and more loss as developed regions are mostly industrialized and more workers are employed with modern technology. Hence the fear of losses was also greater here. In this sense per capita income may fall more than less developed regions with less positive cases and deaths toll, therefore income disparity is decreased, (Deaton 2021).

Pandemic 2019 created misleading to the labour market. Due to restrictions on mobility of labour and to maintain isolation policies, labour supply decreased to 23 percent over the globe. Dingel and Neiman (2020) computed the analysis for the globe and compared with Africa. Their findings showed that almost one third of the labour supply was declined due to the pandemic. While for Africa there was 15 percent decline in labour supply. This sudden decline resulted in huge unemployment over the globe and in Africa.

Regarding the mitigation policies against any pandemic at regional level, government influence is of greater importance. Federal government funds transfer to provincial governments was also of great importance. As in rural areas government quickly launched the schemes to save people from starvation, and ensured the availability of basic needs but in case of rural areas quick compensation was a difficult challenge (Hu 2002). This study added in the existing body of literature by comparing Lorenz curve for both the countries and further empirically examined the role of some important factors highlighted in the existing literature that influence income inequality particularly during covid situation. This gap in the existing literature is a rational to conduct this research.

3. METHODOLOGY AND RESULTS

3.1 Conceptual Framework

The most important scale of measurement to account income inequality is GINI index proposed by Gini in 1912. It is linked with Lorenz curve which measures the numerical value between Lorenz Curve and equi distribution line. Figure 1 shows the Lorenz curves at different points expressing the income distribution and population share. Various combinations show the comparative statics between cumulative population and their income share and there is a rare event to occur where there is equal distribution of income and population share.

Figure given below shows ab as the equi distribution line and abc is the concentration area which shows the level of inequality i.e how this value is above or below the normal line. In the diagram point's ab and abc represents the extreme highest values that the concern area can take in representing Lorenz curve.

Calculation of Gini Index:

Now the Gini index calculates the ratio of concentration area to the maximum value of concentration area as follows:

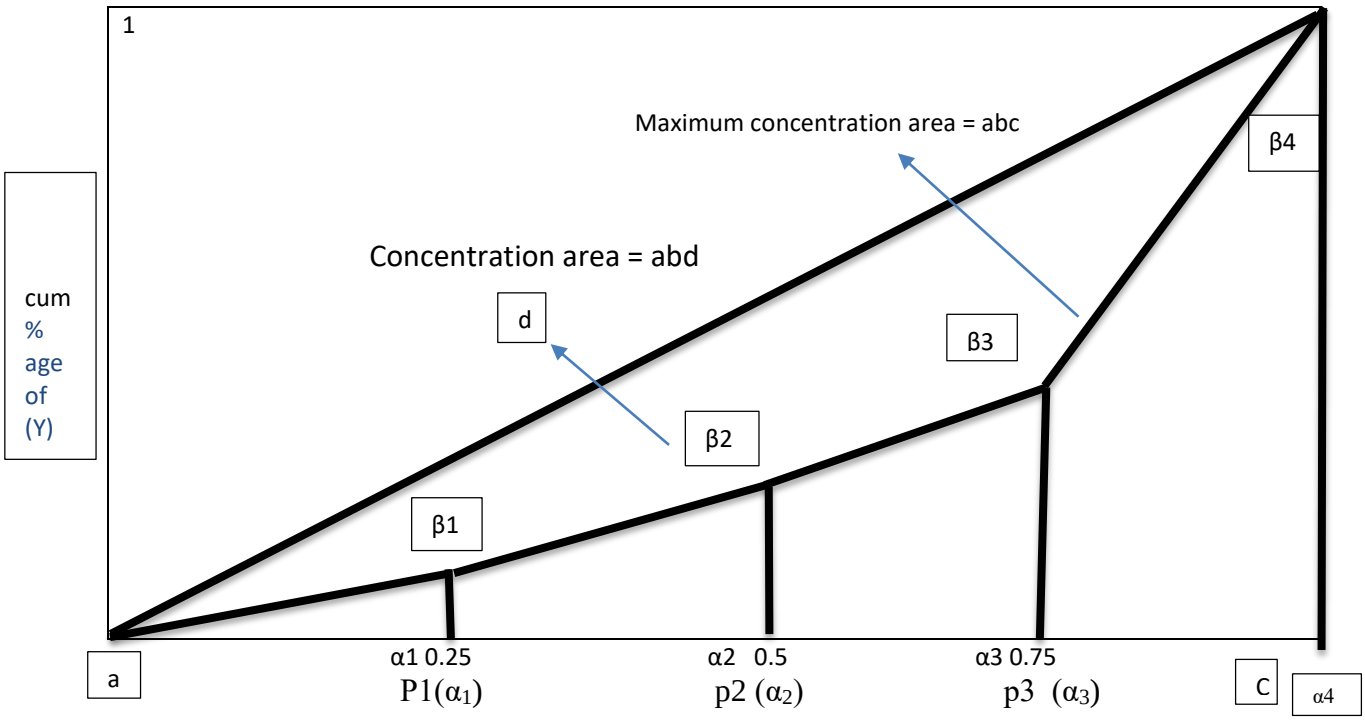
$$G = \frac{abd}{abc} \quad \text{---------- (1)}$$

Now the most important task is how this formula can give numerical values for practical application. In the figure given below abc is a triangle with its base length and height as 1 and its area will be 1/2 therefore the denominator of equation (1) abc = 1/2.

For the numerator, instead of calculating the concentration directly, we exploit the fact that area between the maximum concentration and the area under Lorenz curve abcd.

[2] *Skills towards Employment and Productivity (STEP) survey conducted by US and for the sake of skills acquisitions, to bring the transitions in labour market, employer's perception about labour market, to aware the labour force about start-up capital earnings and the ways to generate startup capital with business expansion.*

Figure.1



Cumulative proportion of population (%)

In this diagram ab is the equivalent line which shows normal equi line indicating the equal share of population and respective income, but it is rare over the world. Here the difference between ab and d indicates the level of inequality. Points ab and abc presents the extreme values and out of these Lorenz curve can assume any value.

Now, the Gini Index accounts the ratio of area abd and abc which are named as concentration area and maximum concentration area as follows:

$$G = \frac{abd}{abc} \quad \text{---------- (2)}$$

Now the important task is how to implement this formula in real terms. For this we start from the denominator of Gini Index. As explained earlier that extreme points of Lorenz curve are at points (1,1). The area abc expresses a triangle with base and height of value 1. Therefore, its area will be ½ which shows that value of abc will be ½.

Now for the computation for numerator of G, if we exploit the fact that instead of directly calculating the concentration area that is given by the difference between maximum concentration area (abc) and the area under Lorenz curve adbc. Area of interest named as Lorenz curve area can be calculated frequently and easily as follows:

For the coordinates of Lorenz curve in its definition it is given as:

$$\beta i = = \frac{Y1+Y2+Y3\ldots\ldots\ldots+Yi}{Y1+Y2+Y3\ldots\ldots\ldots+Yn} = \frac{Y1+Y2+Y3+\cdots\ +Yi}{Y} \quad \text{---------- (3)}$$

This equation shows the income as cumulative proportion. For the cumulative proportion of population, it is written as:

$$\alpha i = \frac{i}{n} \quad \text{---------- (4)}$$

In above two equations it is assumed as $\beta_o = \alpha_o$ and $\beta_n = \alpha_n = 1$

In figure 1, the first polygon is a triangle and other three are the trapeziums where the area of a triangle is $\alpha_o p_1 q_1$. For all other trapeziums area can be calculated individually and then added to get the summation for overall area. Now let us explain the area of i-th polygon as Qi and summation of individual Q's by Q.

The area of triangle is calculated as:

$$Q_i = = \frac{B*H}{2} \quad \text{---------- (5)}$$

$$Q_i = = \frac{\alpha 1 * \beta 1}{2} \quad \text{---------- (6)}$$

Area of a triangle is calculated by multiplying base with height and dividing with two. Similarly, the area of trapezium is calculated with formula:

Area = A + B / 2 * h where A and B are short base and long base which can be written as:

$$Q_i = \frac{(\beta i + \beta i-1)\ \ (\alpha i - \alpha i-1)}{2} \quad \text{---------- (7)}$$

When n = 4, as $\beta o = \alpha o = 0$, then aggregate of the area is given as:

$Q = \sum_{i=1}^{n} Qi = \frac{1}{2}((\beta i + \beta i - 1) \quad (\alpha i - \alpha i - 1)$ ---------- (8)

However, Q is the area under the Lorenz curve and therefore to compute the area of concentration (the numerator of G) it is now required to subtract Q from the max concentration area (1/2) is given as:

$CA = \frac{1}{2} - Q = \frac{1}{2} - \frac{1}{2}\sum i(\beta i + \beta i - 1) \quad (\alpha i - \alpha i - 1)$ ---------- (9)

According to equation (i) Gini Index can be written as:

$G = 1 - 2\,Q$ ---------- (10)

This geometrical computation and interpretation based on Lorenz curve is one of the accurate and feasible method to calculate Gini index. There are also other methods to calculate Gini using the covariance between income and cumulative distribution of income.

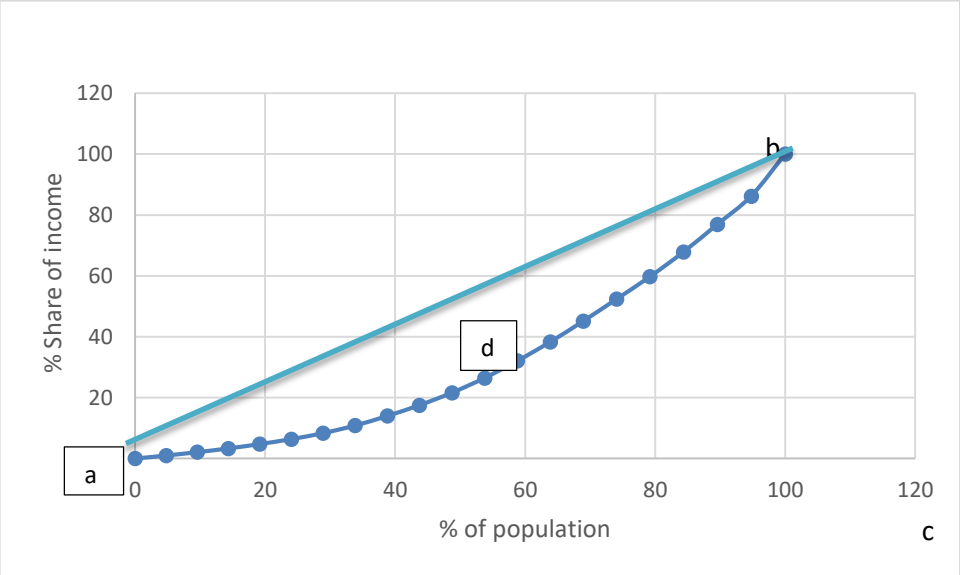
Gini Comparison between Countries:

As Gini index is ratio of comparative static among cumulative percentage of population to cumulative percentage of income. To calculate these two variables, we required a certain change in the data. First, we have to collect the data for selected variable and then calculate cumulative data and at last we compute percentage of the cumulative data as final one.

a) Lorenz Curve for China

For the period 2001-2020, Lorenz curve for China is expressed using the data are presented in the figure given below.

Figure.2 Lorenz Curve for China (2001-2020)

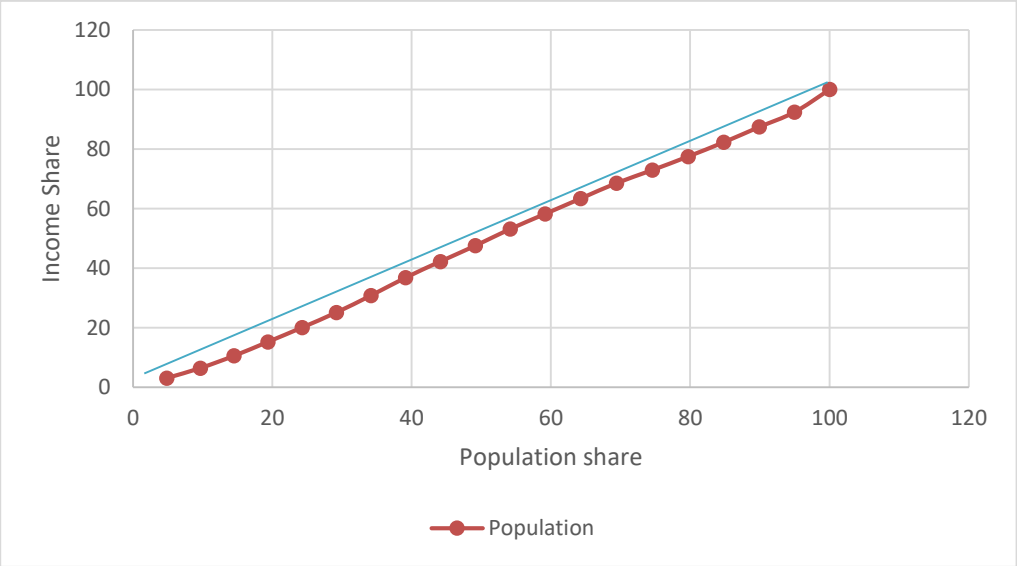


Cumulative percentage of population

This diagram shows that Lorenz Curve indicates inequality as at shows deviations from normal equality line ab. At every point there is greater proportion of population, but lesser proportion of income share which indicates greater inequality in China for the period 2001-2020.

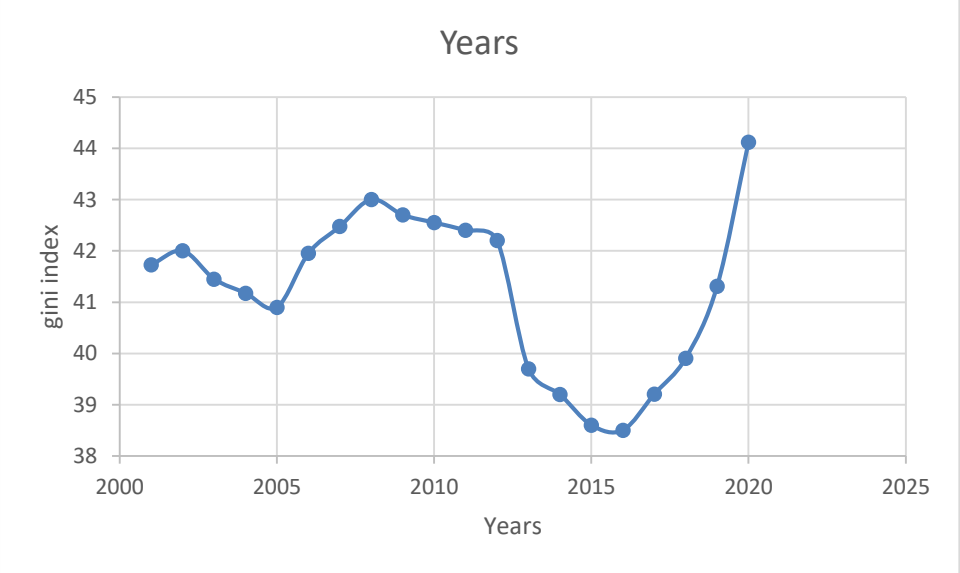
b) Lorenz Curve for Italy (2001 – 2020)

Similar procedure and data followed to analyze the income inequality for Italy.



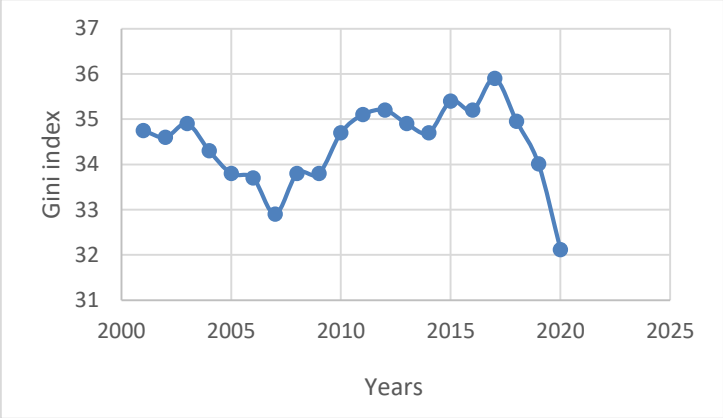
This diagram indicated that in Italy there is less income inequality as compared to china. Even in 2010 there becomes almost equal share of population and income. The gap between population share and income share is low in comparison but still there exists some inequality in Italy.

Figure. 3. Graphical Representation of Inequality in China :(2001- 2020)



This graph shows increasing trend trend in income inequality in China from the year 2019-2020 and onwards. Feng *et al* (2020) also found the similar results for china because due to strict isolation and stay at home policy, more workers became unemployed, and their income level gradually came down. There was strict lock down almost in 250 cities in China other than Hubei province and outdoor work was restricted there. Income of daily wages workers came down and therefore inequality increased (Qiu and Chen 2020). This inequality sharp upturn was seen because income and consumption pattern of the poor suddenly came down due to government policies. But on the other side China saved its huge population from infection and lesser number of deaths toll.

Figure.4. Graphical representation of inequality in Italy (2001-2020)



This graph indicated falling trend in income inequality in the year 2019 and onwards in Italy. As compared to China overall income inequality is less as maximum value of gini coefficient is 36 while in case of China highest value is 45 and also the average values are higher than 40. If we compare the trend in 2019 and onwards, a decision can be made easily that inequality shows falling trend during covid 19 and onwards. Brewer and Tasseva (2021) and Giommoni (2020) also found the similar results for Italy. These studies supported the role of government in this remarkable achievement. As Italian government focused to finance the daily wage workers which became unemployed due to isolation and stay at home policy. When the government financed the poor people, their income level increased and hence decreased income inequality. Giommoni (2020) determined the government better performance to save poorer people from starvation and on the other side this government became successful in reducing the income inequality during worst corona virus situation.

3. RESULTS AND DISCUSSION

As this study is aimed to analyze the income inequality with the help of past data and in the previous chapter income inequality with the help of graphical presentation and trend. There seemed diversified findings for both the countries. Following econometric model is constructed to achieve the desired results.

Inequality = f (Unem, Poverty, Tax)

Inequality is measured by Gini index which is commonly used proxy for income inequality. Unemployment is measured by the unemployment rate as a percentage of the total population. Poverty is measured as the percentage of population that lies below the poverty line and Tax rate is measured as rate of taxes imposed on goods and services as percentage of revenue.

Econometric model for the above function is constructed as:

$Y_{it} = \beta_o + \beta_1 UNE_{it} + \beta_2 POV_{it} + \beta_3 Tax_{it} + \varepsilon_{it}$ ---------- (I)

Data for all these variables have been taken from World Bank for the time span 2000-2021. For empirical analysis, simple ordinary least squares (OLS) technique has been used. Due to lesser number of cross-sections and observations, there are minor chances of endogeneity and multicollinearity that's why OLS was preferred over other techniques.

Table.1: OLS estimates for Inequality.

	Coef.	Std. Err.	z	P>|z|	95% confid. Interval	
Gini.L1	1.0035	.10274	9.77	0.000	.8021	1.205
UNEM	.04153	.00926	4.48	0.000	.0233	.0596
POV	.03471	.00281	12.32	0.000	.0292	.0402
Tax	-.04951	.00372	-13.30	0.000	-.0568	-.0422
cons	.82829	3.058	0.27	0.076	-5.165	6.821

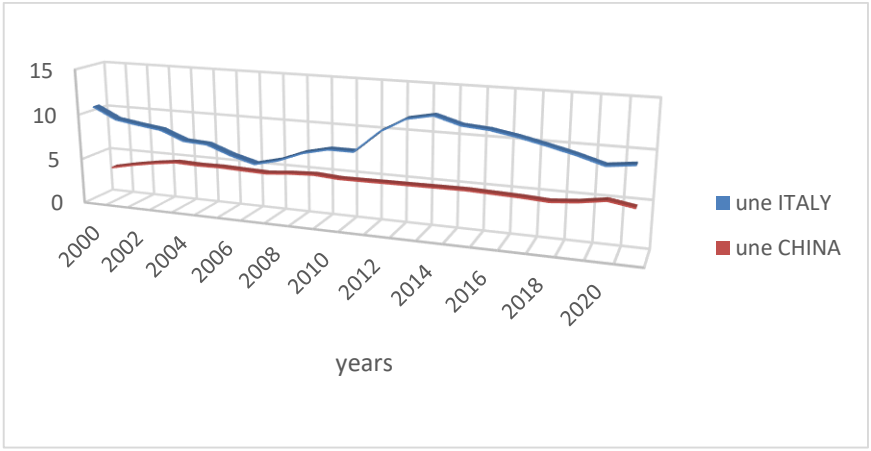
Wald chi^2 = 2.5682018 Prob > chi^2 = 0.0000

R^2 = 0.83 No of obs. 44

These results indicate that the rise in unemployment have significant positive impact on inequality. This is so because when greater proportion of population became unemployed, their income level came down and hence inequality prevails. In case of china similar findings computed by (Fang *et al.,* 2020). They identified that due to strict stay at home policy for precautionary measures

and isolation, more workers became unemployed resulted increased inequality. In case of Italy the findings were contrary because during covid 19 governments compensated only poor and attempted to overcome the requirements of poor. In this situation the velocity of circulation of money increased and hence inequality came down (Brewer and Tasseva 2021). Figure given below shows that overall, there is a big gap in unemployment rate between China and Italy. Italy is facing huge unemployment as compared to China but if we compare the trend since 2016 to onwards, there is sharp declining trend in unemployment rate in Italy even during covid situation there was not a greater change in employment rate. In comparison, China faces a rising trend in unemployment rate since 2016 and more importantly, from 2019 to 2020 China faces an increase in unemployment rate by the end of 2020 and again slight decline in 2021 which indicates that during Covid situation, China faces short run increase in unemployment rate that could be the reason for income inequality.

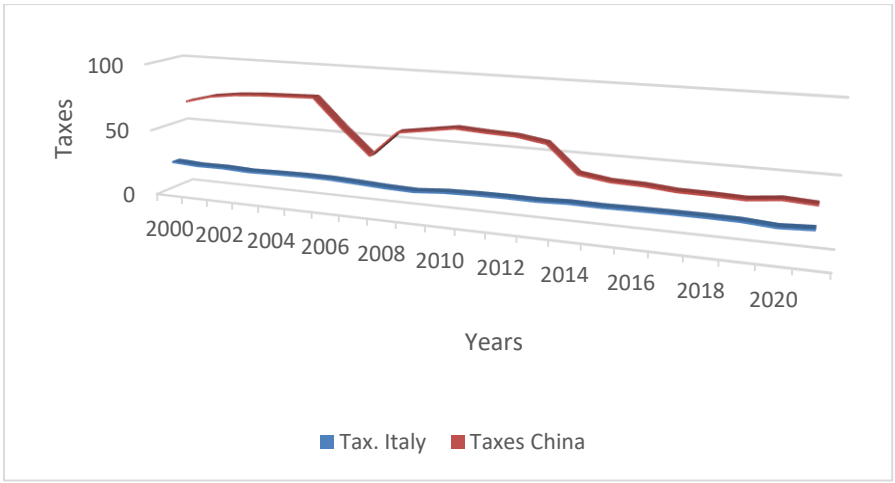
Figure. 5 Unemployment in Italy and China (2000 -2021)



Poverty has also shown positive and highly significant relation with income inequality. When the proportion of population lies below the poverty line, the class distinction is created among rich and poor. For both the countries poverty have shown significant impact on inequality (Galletta and Giommoni 2020).

Another important finding in this study is that tax rate shows negative but significant relation with inequality. The role of government is more important in normal as well as in crucial situation. For both the countries government imposed higher taxes on luxuries and imposed lower taxes on necessities. In the result, purchasing power of the people increased due to lower tax rates on necessities and due to higher tax rate on luxuries wealth transferred from rich to poor. This policy even adopted by most of the developed and developing countries. Similar findings computed by Gozgor (2021). Tax ratio between China and Italy is given in figure 6, which shows that tax ratio on goods and services in Italy is quite lower than China. If we compare the tax ratios in both countries since 2016 and onwards, there seems a decline in tax ratio in Italy while it seems similar trend for China. From 2019 to onwards during covid situation, Italy increases taxes on luxury items and decreased taxes on necessities while in China, overall tax ratio showed a small decline in 2020 and again increased in 2021 while in Italy it declines. This decline in tax ratio during Covid situation can also be a difference in inequality in both countries.

Figure. 6 Tax comparison between China and Italy



5. CONCLUSION AND POLICY IMPLICATIONS

This study aims to analyze the impact of covid 19 on inequality for the selected countries Italy and China. Graphical representation indicates contradictory results for two countries as China have shown increasing trend in gini index whereas Italy have sown falling trend in income inequality in 2020.

From the past data analysis from 2000- 2021 for both the countries, both the variables poverty and unemployment indicated positive and significant relation with inequality while tax rate have shown negative and significant relation with income inequality.

From the above all findings, there are specific policies for both the countries as in Italy, government targeted poor but it was easier due to less population and to maintain social distance, isolation and stay at home stance. But in case of China, due to huge population and more severe attack of covid-19, government preferred to protect population infection. In this way due to huge population, they preferred to maintain the social distancing and ordered to follow strict isolation policy. In this regard poor workers were merely affected and found rising trend in income inequality. China needs more attention to finance poor people if such complicated situation happens again due to corona virus attack. Italy is already capital enriched country and to maintain lower level of inequality need continue efforts to finance poor. This study has some limitations as these two countries have different population density, per capita income, asset's structure and government priorities keeping in view the domestic economic position. Furthermore, these are the long run results, but corona virus effects can be analyzed better in short run. Other researchers can extend it by using better techniques and short run comparison with long run.

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